SECTION I.—AEROLOGY.

SOLAR AND SKY RADIATION MEASUREMENTS DURING APRIL, 1918.

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[Dated: Weather Bureau, Washington, D. C., May 31, 1918.]

For a description of instrumental exposures and an account of the methods of obtaining and reducing the measurements the reader is referred to the REVIEW for January, 1918, 46:2.

The monthly means and departures from normal values in Table 1, show that direct solar radiation averaged considerably above normal at Washington, D. C., and about normal at Madison, Lincoln, and Santa Fe.

Table 3 shows a deficiency of 12 per cent and 5 per cent, respectively, at Washington and Madison as compared with the normal radiation for April. The average for Lincoln was very close to normal.

The reading of 1.51 at air mass 1.19 on April 5 is the highest ever obtained at Washington. This value remains unchanged when corrected for radius vector, or mean solar distance. The rapid decrease in radiation during the afternoon of this date was undoubtedly due to the increasing dust and haze in the atmosphere, as the vapor pressures changed but little during the day.

Skylight polarization measurements obtained at Washington on 5 days give a mean of 60 per cent, with a maximum of 66 per cent on the 5th, which is as high as has been obtained in Washington during April since 1907. Measurements obtained at Madison also give a mean of 60 per cent, with a maximum of 68 per cent on the 23d.

TABLE 1.—*Solar radiation intensities, during April, 1918.*

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1918 A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
April 2			0.95	0.89						
5	1.54	1.42	1.33	1.24	1.15	1.08	1.00	0.94	0.88	0.82
6	1.29	1.13	1.11	1.00	0.95		0.75	0.72	0.67	
15				0.76						
16		1.06								
17			0.77							
19		1.12	1.00	0.87	0.79	0.70			0.56	
22		1.24			0.91	0.85				
23	1.33	1.20								
24	1.23									
25	1.42	1.18								
Monthly means	1.36	1.19	1.03	0.95	0.95	0.88	(0.88)	(0.83)	0.70	(0.82)
Departure from 10-year normal	+0.01	+0.02	−0.02	±0.00	+0.08	+0.07	+0.15	+0.10	+0.03	+0.17
P. M.										
April 5		1.40	1.28	1.17	1.07	0.97	0.86	0.80	0.72	0.66
6		1.24	1.02							
14		1.32	1.17	1.03	0.93					
23		1.18								
25		1.20								
Monthly means		1.27	1.16	(1.10)	(1.00)	(0.97)	(0.86)	(0.80)	(0.72)	(0.66)
Departure from 10-year normal		+0.06	+0.09	+0.11	+0.18	+0.13	+0.10	+0.20	+0.18	

TABLE 1.—*Solar radiation intensities, during April, 1918*—Continued.

Madison, Wis.

Date.	Sun's zenith distance. 0.0°	48.3°	60.0°	66.5°	70.7°	73.6°	75.7°	77.4°	78.7°	79.8°
	Air mass. 1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5
1918 A. M.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 2		1.24								
3		1.39	1.31	1.23						
4		1.42	1.29	1.22	1.15	1.08	1.01	0.95	0.90	
10		1.47	1.35							
13			1.08	0.91	0.84					
23	1.41									
Monthly means	(1.41)	1.38	1.26	1.12	(1.00)	(1.08)	(1.01)	(0.95)	(0.90)	
Departure from 8-year normal	+0.02	+0.04	+0.04	−0.01	−0.08	−0.02	−0.03			
P. M.										
Apr. 4		1.42	1.29	1.18						
8		1.45	1.30							
10		1.47	1.34							
12		1.23	1.12							
23		1.31	1.19	1.09	1.04					
Monthly means		1.38	1.25	(1.14)	(1.04)					
Departure from 8-year normal		+0.02	−0.02	−0.04	−0.06					

Lincoln, Nebr.

A. M.										
Apr. 1		1.21								
7		1.31	1.19	1.11	0.99	0.89	0.79			
9	1.45	1.35	1.25	1.15						
16	1.42	1.21		0.99	0.91	0.83	0.72			
18		1.28	1.16	1.03	0.95	0.88	0.81	0.75		
28		1.34	1.24	1.13	0.98	0.91	0.82			
30		1.44								
Monthly means	(1.44)	1.28	1.21	1.08	0.96	0.88	0.78	(0.75)		
Departure from 3-year normal	−0.05	−0.07	−0.03	−0.04	−0.06	−0.04	−0.04	−0.10		
P. M.										
Apr. 8		1.34	1.25	1.18	1.11	1.00	0.92	0.88	0.84	
9		1.35	1.25	1.15	1.07	1.00				
30		1.28	1.13	1.04	0.97	0.91	0.84	0.81	0.79	
Monthly means		1.32	1.21	1.12	1.05	0.97	0.88	0.84	0.79	
Departure from 3-year normal		+0.02	+0.06	+0.07	+0.08	+0.07	+0.02	+0.02	+0.07	

Santa Fe, N. Mex.

A. M.										
Apr. 2	1.54	1.40								
4		1.43			1.09					
8		1.37			1.05	0.97				
9	1.39									
19			1.32	1.23	1.16	1.08				
22	1.49	1.37			1.11	1.03				
Monthly means	1.47	1.39	(1.32)	(1.23)	1.10	1.03				
Departure from 6-year normal	−0.06	−0.04	−0.03	−0.02	−0.08	−0.09				
P. M.										
Apr. 2		1.42								
8		1.35								
9		1.35	1.31							
21				1.21	1.12	1.04	1.01	0.94	0.89	
Monthly means		1.44	(1.31)	(1.21)	(1.12)	(1.04)	(1.01)	(0.94)	(0.89)	
Departure from 2-year normal		+0.12	+0.18	+0.14	+0.12	+0.06				

TABLE 2.—*Vapor pressures at pyrheliometric stations on days when solar radiation intensities were measured.*

Washington, D. C.			Madison, Wis.			Lincoln, Nebr.			Santa Fe, N. Mex.		
Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.	Date.	8 a. m.	8 p. m.
1918.	*mm.*	*mm.*	1918.	*mm.*	*mm.*	1918.	*mm.*	*mm.*	1918.	*mm.*	*mm.*
Apr. 2	9.83	8.48	Apr. 2	3.63	4.75	Apr. 1	2.74	4.75	Apr. 2	3.00	2.16
5	2.26	2.62	3	2.62	2.62	7	4.17	2.62	4	3.00	3.15
6	3.00	3.63	4	2.74	2.49	8	1.88	2.62	8	4.17	4.37
14	4.57	4.75	10	2.16	2.49	9	1.96	2.49	9	3.15	2.87
15	4.75	5.16	12	4.37	2.49	16	5.16	5.79	19	2.26	4.37
16	7.04	10.21	13	2.36	2.74	18	4.17	4.57	21	2.87	2.49
17	10.97	14.10	23	3.00	3.00	28	4.57	3.81	22	2.36	2.62
19	6.50	9.47	.....	.....	.....	30	4.57	3.45	.....	.....	.....
22	7.04	5.56	.....	.....	.....	.....	.....	.....	.....	.....	.....
23	8.18	10.59	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	4.17	5.56	.....	.....	.....	.....	.....	.....	.....	.....	.....
25	5.36	4.75	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Daily totals and departures of solar and sky radiation during April, 1918.*

[Gram-calories per square centimeter of horizontal surface.]

Day of month.	Daily totals.			Departures from normal.			Excess or deficiency since first of month.		
	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.	Washington.	Madison.	Lincoln.
1918.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
Apr. 1	380	524	542	−1	135	118	−1	135	118
2	473	371	233	90	−20	−182	89	115	−64
3	177	510	180	−208	117	−246	−119	232	−310
4	205	558	552	−183	163	124	−302	395	−186
5	634	511	120	243	114	−310	−59	509	−496
6	574	102	536	182	−297	105	123	212	−391
7	194	196	521	−200	−204	89	−77	8	−302
8	184	631	640	−212	229	207	−289	237	−95
9	44	606	638	−354	203	204	−643	440	109
10	75	643	596	−325	238	161	−968	678	270
11	41	444	643	−361	38	207	−1,329	716	477
12	206	575	559	−198	167	122	−1,527	883	599
13	267	571	563	−139	162	125	−1,666	1,045	724
14	615	516	236	207	105	−203	−1,459	1,150	521
15	568	416	261	158	3	−179	−1,301	1,153	342
16	406	306	572	−6	−110	131	−1,307	1,043	473
17	390	93	552	−24	−326	109	−1,331	717	582
18	311	183	456	−107	−239	11	−1,438	478	593
19	470	518	95	47	93	−351	−1,391	571	242
20	112	153	243	−315	−275	−204	−1,706	296	38
Decade departure							−738	−382	−232
21	281	78	390	−150	−353	−58	−1,856	−57	−20
22	442	566	478	6	132	28	−1,850	75	8
23	561	558	418	120	121	−34	−1,730	196	−26
24	585	611	432	140	171	−22	−1,590	367	−58
25	626	464	648	177	21	184	−1,413	388	125
26	383	398	249	−69	−47	−207	−1,482	341	−82
27	534	190	82	79	−256	−375	−1,403	85	−457
28	601	129	488	142	−319	30	−1,261	−234	−427
29	339	203	625	−123	−246	165	−1,384	−480	−262
30	338	259	684	−128	−192	223	−1,512	−672	−29
Decade departure							+194	−968	−67
Excess or deficiency since first of year. (calories							−995	+865	−579
Excess or deficiency since first of year. (per cent							−2.8	+2.4	−1.4

ABSORPTION AND RADIATION OF THE SOLAR ATMOSPHERE.

By SHIN HIRAYAMA.

[*Abstract reprinted from* Nature, London, Apr. 18, 1918, 101:134.]

A paper by Prof. Shin Hirayama appears under this title in the Proceedings of the Tokyo Mathematico-Physical Society, second series, volume 9, page 236. Utilizing observations of the radiation from different parts of the solar disk which have been made by Abbot, Prof. Hirayama computes the transmission and radiation of the solar atmosphere, on Schuster's supposition that a great part of the solar radiation comes from an absorbing and radiating layer above the photosphere. It is shown that the observations are better represented in this way than by the previous calculations of Biscoe, in which the radiation of the atmosphere was not considered. The coefficient of transmission increases gradually with the wave-length, and the radiation due to the atmosphere ranges from one-third of the whole radiation for the shorter wave-lengths to nearly one-half as the wave-length increases. Assuming the effective temperature of the sun to be 6,000° Abs., it is calculated that the temperature of the photosphere is about 7,040°, while that of the absorbing layer is 5,210°

HALO OF APRIL 14, 1918, AT COLUMBUS, OHIO.[1]

By HOWARD H. MARTIN, Observer.

[Dated: Weather Bureau, Columbus, Ohio, April 19, 1918.]

A very complex and highly colored solar halo with four attendant parhelia and a vividly colored circumzenithal arc was observed at this station (lat. 39° 58′ N.; long. 83° 0′ W.) from 4:50 p. m. to 5:40 p. m., *Normal* 90th Meridian Time.

The accompanying drawing, figure 1, depicts the phenomenon as it appeared at the moment of greatest color and distinctness, viz, 5:12 p. m. The circumzenithal arc was visible from the moment of first appearance (4:50 p. m.) to about 5:02 p. m., and again from 5:08 p. m. to 5:15 p. m. Probably the most highly colored and brilliant of the four parhelia was that one observed at the junction of the upper bitangent arc of the 46°-halo and the circumzenithal arc. At the time of greatest intensity there was a faint coloring about the zenith, suggesting the presence of Kern's Arc, but the coloring faded without a well-defined appearance.

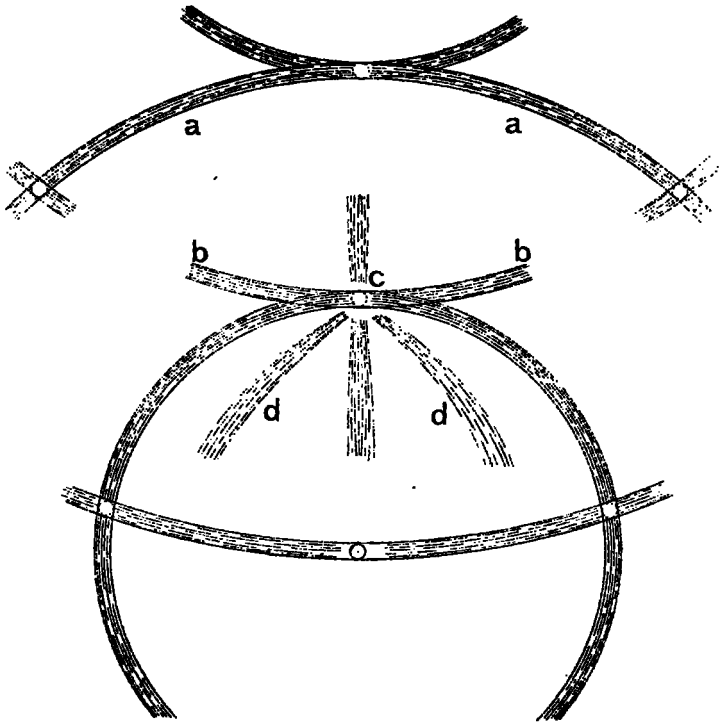

FIG. 1.—Solar halos observed at Columbus, Ohio, Apr. 14, 1918 (5:12 p. m. 90th M. T.).

A light pillar extended upward from the sun for a very short period of time subsequent to 5:10 p. m., and at the same time faint fragments of upper arcs of circumscribing halos were visible.

The halo occurred after a day of fine weather. A sudden movement of cirro-stratus from the southwest occurred between 3:30 p. m. and 6 p. m., with a stationary barometer and a temperature of 64°. The cloudiness passed as quickly as it came and the phenomenon was followed by no immediate weather change of note, although precipitation occurred during the subsequent 36 hours.

NOTE.

In the sketch, figure 1, furnished by Mr. Martin, there are indicated two very unusual forms, and in addition one

[1] Publication approved by Division of Aërological Investigations.